DOCUMENT RESUME

ED 183 401 SE 030 310

AUTHOR Zastrocky, Michael: Trojan, Arthur
TITLE People Patterns: Statistics. Environmental Module for Use in a Mathematics Laboratory Setting.
INSTITUTION Regional Center for Pre-Coll. Mathematics, Denver, Colo.
SPONS AGENCY National Science Foundation, Washington, D.C.
PUB DATE 73
GRANT NSF-GW-7720
NOTE 27p.: For related documents, see SE 030 304-322

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Activities: Graphs: *Learning Laboratories: Mathematics Curriculum: *Mathematics Instruction: Sampling: Secondary Education: *Secondary School Mathematics: Statistical Analysis: Statistical Bias: *Statistics: Worksheets

ABSTRACT

This module on statistics consists of 18 worksheets that cover such topics as sample spaces, mean, median, mode, taking samples, posting results, analyzing data, and graphing. The last four worksheets require the students to work with samples and use these to compare people's responses. A computer dating service is one result of this work. Teaching suggestions are included. (MK)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Mary L. Charles
NSF
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

ED183401

ENVIRONMENTAL MODULE FOR USE IN A MATHEMATICS LABORATORY SETTING

TOPIC: People Patterns - Statistics

by

Michael Zastrocky
Arthur Trojan

A Publication of

University of Denver
Mathematics Laboratory
Regional Center for
Pre-College Mathematics
Dr. Ruth I. Hoffman, Director

This material was prepared with the support of the National Science Foundation Grant #GW-7720.

© University of Denver Mathematics Laboratory 1973

SE 030 310

People Patterns - STATISTICS

This module may be used in many ways.

1. It may be used as a complete unit.
2. It may be used in part or in total to supplement other materials you already have.
3. Groups of students may be assigned to various experiments according to past performances.
4. The class may be divided so each group has a leader with the ability to help the other members of the group.
5. You may want to group for different activities then pool the results.

Materials

Contained in this module:

1. A height-weight chart.
2. Sample Computer Program.

Teacher must provide:

1. Graph paper
2. Bathroom scales
3. Meter stick(s)
4. Telephone directory
5. Newspapers and/or magazines

Optional (teacher provides)

1. Computer access

OBJECTIVES

.Given a problem, students will be able to make a random sample.

.Given a sample, students will be able to find the mean.

.Given a sample, students will be able to find the median.

.Given a sample, students will be able to find the mode.

.Given a set of statistics, students will be able to compare, gather, and finalize the results.

.Given a sample space, students will be able to graph the results.

.Given a sample, students will be able to bias the information on a graph.

.Students will be able to determine how a graph is biased.

.Given a sample space, students will be able to determine how a graph is biased.

.Given a sample space, students will be able to determine percents for each part.

© '73 U of DM

OVERVIEW

.The module has activities grouped together in the following ways.

.In Student Worksheets #1 - 5, students discover sample spaces, the mean, median and mode.

.In Student Worksheets #6 - 12, students work with taking samples and posting results.

.In Student Worksheet #13, students use the results of Student Worksheets # 6 - 12 and analyze these results.

.In Student Worksheet #14, students work with graphs and how to bias data with the graph.

.In Student Worksheet #15 - 18 students work with samples and use these to compare people's responses. Computer dating service is a result.

OUTLINE

I. Student Worksheets #1 - 5

- A. Materials provided:
  - 1. Student Worksheets # 1 - 5
- B. Materials needed:
  - 1. Newspapers or magazines with graphs
- C. Work to be completed by students:
  - 1. Worksheets # 1 - 5
- D. Teaching suggestions:
  - 1. You may want to use examples from newspaper statistics and examine the data using the mean, median and mode.

II. Student Worksheets # 6 - 12.

- A. Materials provided:
  - 1. Student Worksheets #6 - 12
- B. Materials needed:
  - 1. Bathroom scale
  - 2. Meter sticks
- C. Work to be completed by students:
  - 1. Worksheets # 6 - 12
  - 2. May want to share and compare results with each other.
- D. Teaching suggestions:
  - 1. You could have the students work in groups on each different activity.
  - 2. You could have the whole class working all the activities.

III. Students Worksheet # 13

- A. Materials provided:
  - 1. Student Worksheet # 13
- B. Materials needed:
  - 1. Results from Student Worksheets # 6 - 12
- C. Work to be completed by students:
  - 1. Worksheet # 13
- D. Teaching Suggestions:
  - 1. You might have different groups use different analizations of the same data to determine Mr. Mod and Ms. Mod.
  - 2. You may want to publicize results in the school paper or at a pep assembly.

IV. Student Worksheets # 14

- A. Materials provided:
  - 1. Student Worksheet # 14
- B. Materials needed:
  - 1. Newspapers or magazines with graphs
- C. Work to be completed by students:
  - 1. Worksheets # 14
  - 2. Might compare results with each other

D. Teaching suggestions:
   1. You may want to give the students the same set of data and compare the bias of each person in their graph.
   2. You may wish to show the different types of graphs and how to bias each, for example: bar graphs, line graphs, picture graphs, etc.

V. Students Worksheets # 15 - 18

A. Materials provided:
   1. Student Worksheets 15 - 18
   2. Sample Computer Program

B. Materials needed:
   1. Computer access
   2. Telephone directories

C. Work to be completed by students:
   1. Student Worksheets # 15 - 18
   2. Determine an unbiased questionnaire.

D. Teaching suggestions:
   1. You may want to culminate the module with a computer dating service.
   2. You may want to have the "perfect match" announced at an assembly or in the school paper.

Answer Key

Worksheet # 1 - The mean of the Penn Street Salaries - $10,500

Worksheet # 2 - The mode for the team heights - 210 cm.

Worksheet # 3 - The median golf score - 91.

Worksheet # 4 - Mean average = $15,555.56

Mode average = $7,500.00

Median score = $12,000.00.

The median or middle occurring salary is the most useful.

Worksheet # 5 - It does not matter who you sample.

© '73 U of DML

What Do You Mean?

Test scores for the week are 90, 80, 77, and an 85 on 4 different papers.

Add the 4 grades.

$$\begin{array}{r} 80 \\ 90 \\ 77 \\ +\ 85 \\ \hline 332 \end{array}$$

Find the total and divide this sum by the number of grades.

$$\begin{array}{r} 83 \\ 4\overline{)332} \\ \underline{32} \\ 12 \\ \underline{12} \end{array}$$

The average is 83. This average is also called the statistical mean.

The people on Penn Street earn the following yearly salaries:

$$\begin{array}{r} \$\ 8{,}500 \\ 9{,}000 \\ 5{,}000 \\ 11{,}500 \\ 20{,}000 \\ 9{,}000 \end{array}$$

Find the mean (average) of the Penn Street salaries.

© '73 U of DML

In The Mode

In a class test, the frequency distribution (how many of each item) looked like this:

Score	How many
90	1
87	3
75	6
63	2
50	1

More people scored 75 than any other score. The item that occurs most frequently is called the mode.

The heights of the Denver Rippits basketball team are:

200 cm.
215 cm.
214 cm.
200 cm.
210 cm.
210 cm.
210 cm.
215 cm.
211 cm.
202 cm.
180 cm.

Find the mode for the team heights.

© '73 U of DML

Median Is The Message

Suppose you received the following scores: 90, 80, 60, 70, 60. Arrange these scores in order from highest to lowest. Count the number of scores you have. In this example you have five scores. Divide the number 5 by 2 (always 2). This will give you an answer of $2\frac{1}{2}$. Round up to the next number. In our example this would give you 3. Your answer is the middle score (the median). It is 3 numbers from the top or 3 numbers from the bottom of the column of numbers, or 70 in our example. In the event there is no middle number, take the average of the two middle scores.

The golf scores on the golf team for a given match were:

85
76
102
96
82
91
105

Find the median score.

© 73 U of DML

Salaries

A sample of Ferndoc Corporation annual salaries is:

$12,000
15,250
17,000
21,000
8,000
7,500
6,750
7,500
45,000

What is the mean? What is the mode? What is the median? Which analysis, mean, mode, or median is the most useful in discussing what an employee's salary is for Ferndoc?

© '73 U of DML

Are You A Pole Cat?

The Gallopim Poll indicates that people are cutting down on the use of beef because of inflation. This poll is also called a sample space. In the following activities we will be working with sample spaces. A sample space (sample) is basically the same as the polls you see in the newspapers and hear about in the news.

To take a sample, you must decide how many people you will include in your sample and how you will pick them. You may want to look in some newspapers (age of newspaper doesn't make a difference here) and find some samples.

Does it matter who you sample?

Does the wording of the questions make any difference?

© '73 U of DML

Hair Today, Gone Tomorrow

How do we fit into the pattern of people? Are we similar? different? In what ways are we similar and different?

Pick out a sample of students (same sex as yourself) from your school and group them according to hair color. The sample should include at least 25 people.

Hair Color:

Blond	Light Brown	Brown	Black	Red
How Many:				

© '73 U of DML

Heavy - Weight

Pick out a sample of students (same sex as yourself) from your school and group them according to weight. You may want to group the members of your sample in 5 lb. intervals. The sample should include at least 25 people.

WEIGHTS:

90 - 94	150 - 154
95 - 99	155 - 159
100 - 104	160 - 164
105 - 109	165 - 169
110 - 114	170 - 174
115 - 119	175 - 179
120 - 124	180 - 184
125 - 129	185 - 189
130 - 134	190 - 194
135 - 139	195 - 199
140 - 144	200 - 204
145 - 149	205 - above

© '73 U of DML

Butter Ball

It is said that Americans are "fat". Use the information recorded in your sampling and compare these figures with the weight chart provided. Compare and determine if, for the height and bone structures, it's true that American's are too fat.

© '73 U of DML

The Sky's The Limit

Pick out a sample of students (same sex as yourself) from your school and group them according to height. You may want to group members of your sample in 5 cm. intervals. The sample should include at least 25 people.

Heights:

140	cm.	-	144	cm.
145	cm.	-	149	cm.
150	cm.	-	154	cm.
155	cm.	-	159	cm.
160	cm.	-	164	cm.
165	cm.	-	169	cm.
170	cm.	-	174	cm.
175	cm.	-	179	cm.
180	cm.	-	184	cm.
185	cm.	-	190	cm.

© '73 U of DML

Eye Full

Pick out a sample of students and group them by eye color. (The sample should include at least 25 people.) You may want to group them as follows:

Eye Color

Blue	Brown	Green	Grey
How Many			

© '73 U of DML

My Heart Beats For You

Measure your rate of heartbeats (how many beats per minute). Does it differ when you have just finished running from when you are sitting? What kinds of activities cause your heart rate to change? Make a sample of people's heart rates. You may want to graph the results to show some activities that cause the heart to beat faster than other activities.

© '73 U of DML

Try to figure out percents for each part of the sample. For example, here is the sample space of 60 people using hair color:

Blond	Brown	Black	Red
10	25	20	5

In percents this would be:

Blond	Brown	Black	Red
16.7	41.7	33.4	8.3

Hair Color:

Eye Color:

Weights:

Heights:

Heart Beats:

© '73 U of DML

Mod Squad

You have a set of people statistics. Your sample should give a picture of the physical appearances of the people in your school. Using the sample spaces, design what the "mod" person of your school looks like. You can use the mean, median or mode in determining the characteristics of Mr. Mod and Ms. Mod.

For example: according to our sample spaces Mr. Mod on this staff has orange hair, purple eyes, is 145 cm. tall, weighs 210 - 214 lbs. Ms. Mod has green hair, pink eyes, is 184 cm. tall and weighs 95 - 99 lbs.

	Mr. Mod	Ms. Mod
Height		
Weight		
Hair Color		
Eye Color		
Heart Beats		

© '73 U of DML

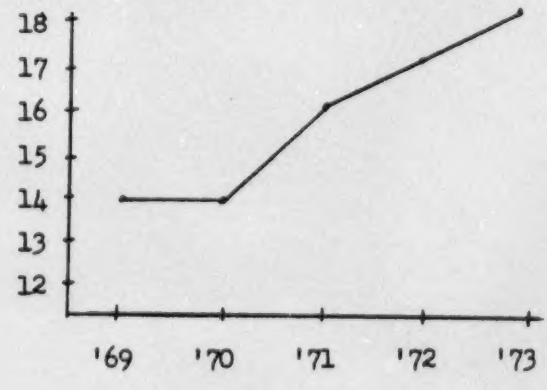
Graphs And Other Vices

Every day newspapers publish articles using graphs to explain some point of view. Very often the graph is made to exaggerate a point of view. The statistics are not wrong but the way they are presented in the graph tends to imply something that may not be entirely true.

Fred Blitzki had the following yearly home run totals for 1970-1974. He used this graph attempting to get more money.

1969 - 14
1970 - 14
1971 - 16
1972 - 17
1973 - 18

Fred's Graph

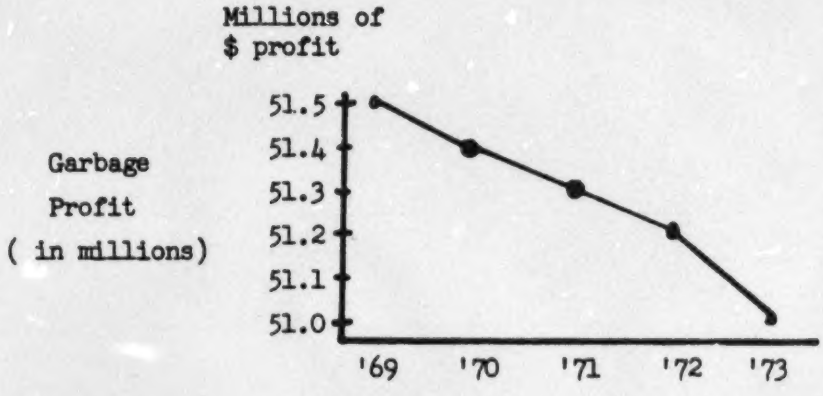


The graph tends to show that Fred has really been swinging the bat the last 3 years, but actually the gain has not be that great.

© '73 U of DML

Graphs And Other Vices

Flat Bush Corporation president, John R. Small, wants to get rid of Manager Fred Bags. Bags is in charge of garbage profit. Small uses the following graph to show Bags is doing a bad job.



Has Bags really done as badly as the graph first appears to show?
Can you make a simple graph showing some bias using truthful information?

Look in the newspaper or magazine and find some graphs that are drawn to exaggerate some point of view.

Can you make a graph using some of your statistics to exaggerate truth?

© 73 U of DML

People are not just their physical appearances. What they think, how they feel, what they believe in, help to make up the differences.

Make a sample using at least 25 members of both sexes from your school on "Thinking Differences". Some questions you may want to use to determine "thinking differences are:

Are athletics important to you?

yes no undecided

Do you enjoy participating in sports more than watching them?

yes no undecided

Are you a 1st child, 2nd , 3rd or ? in your family.

1st child 2nd child 3rd child 4th child 5th child 6th or up

Do you believe in revenge against people who hurt you?

yes no undecided

Do you give without expecting to receive?

yes no sometimes

Would you say your political beliefs are:

Republican Democrat Independent Other

Which of the following tends to classify your religious beliefs?

Jewish Atheist Christian Moslem Buddhist Other

© '73 U of DML

Smith And Jones May Be Wrong

Make a sample to find what first name is most frequently used for boys, and what first is most frequently used for girls? Work in pairs and use a telephone directory to do this.

Next, make a sample to find the most common last name used. List in order of frequency the top five names. Would this be the same for differences?

© '73 U of DML

Foxy-Fix-Em-Up

Compile a questionnaire that could be useful in determining compatibility for dating. Avoid questions that presuppose a given answer.

For example:

"Which would you rather have, $1,000 or a 6 penny nail."

This question is ridiculous, yet many questionnaires have questions just as ridiculous. The questions should have answers in form of, yes - no, or never.

Never		Sometimes		Always
1	2	3	4	5

The above types of answers are easy to compare for dating purposes. Keep the number of questions somewhere between 10 - 20, if possible. Here is a sample questionnaire:

	None		Some		All
1. Do you like athletics?	1	2	3	4	5
	No		Sometimes		Always
2. Do you like exotic foods?	1	2	3	4	5
3. Do you enjoy roughing it?	No		Sometimes		Yes
	1	2	3	4	5

© '73 U of DML

Foxy-Fix-Em-Up # 2

The questionnaire you have compiled can now be used to match people for dating. The computer should be used here because of the amount of arithmetic necessary to match people.

Here are the results of the sample questionnaire for Shirley and Fred:

Question	Shirley's Response	Fred's Response	Difference
No. 1	2	4	2
2	3	3	0
3	1	4	3
		Sum	5

Here are the results of the sample questionnaire for Shirley and George:

Question	Shirley's Response	George's Response	Difference
No. 1	2	3	1
2	3	3	0
3	1	4	3
		Sum	4

According to their responses, Shirley and George had a better match than Shirley and Fred. (The sum of their differences is less.)

Note: You have to be sure that people are attempting to answer honestly and that 2 people haven't gotten together to get the same results.

© '73 U of DML